substrate, by mechanically polishing a back side opposite to the circuit-formed side. The mechanical polishing forms a damaged layer including a micro-crack at the surface of the silicon substrate. To prevent strength of the silicon substrate from decreasing due to this damaged layer, etching is performed to remove the damaged layer after the mechanical polishing. As this etching, plasma etching is utilized instead of conventional wet etching using a chemical solution.

A1 cont'

Page 2, lines 6-8, cancel and replace with:

An exemplary embodiment of the presently claimed invention is a method of plasma-processing a silicon-containing object at a high etching rate while generating no hazy appearance on the surface of the object, thereby to have excellent visual quality.

A2

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Page 3, lines 1-15, cancel and replace with:

Referring to Fig. 1, the plasma processing apparatus will be described below. The inside of a vacuum chamber 1 is a process chamber 2 for plasma processing. In this process chamber 2, a lower electrode assembly 3 and an upper electrode assembly 4 are arranged to be vertically opposed to each other. The lower electrode assembly 3 includes an electrode 5 mounted to the vacuum chamber 1 via an insulator 9 with a support unit 5a extending downwardly. A mounting unit 6 made of material having high thermal conductivity is mounted to the top surface of the electrode 5. On the top surface of the mounting member 6, a semiconductor wafer 7, a silicon-containing object to be processed, is mounted. This wafer 7 has a back side which has just been polished mechanically opposite to a circuit-formed side. The wafer 7, having a protective sheet 7a affixed to the circuit-formed side of the wafer 7, is mounted on the mounting unit 6 with the sheet contacting the unit 6 as shown in Fig. 2A and with the polished side facing upward.

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Page 4, lines 5-8, cancel and replace with:

A4

The electrode 5 is connected to a high-frequency power supply 12. The process chamber 2 within vacuum chamber 1 is connected to an evacuating/opening unit 13. The unit 13 evacuates the process chamber 2 and opens process chamber 2 to atmospheric air when the vacuum is broken.

Page 4, line 21 to Page 6, line 11, cancel and replace with:

A5

The gas supply unit 19 supplies gas containing sulfur hexafluoride (SF_6) and helium (He) mixed in a volume ratio ranging from 1:1 to 1:10 as the plasma-generating gas. The mixing ratio of sulfur hexafluoride to helium is determined primarily according to an etching rate and visual quality of the etched side (the polished side). When the mixing ratio of sulfur hexafluoride is high (i.e. SF_6:He=1:1), the etching rate increases, thereby decreasing the visual quality due to a hazy

etched side. When the mixing ratio of sulfur hexafluoride is low (i.e., SF_6:He=1:10), the visual quality with a mirror-like etched surface decreases, thereby decreasing the etching rate.

The plasma-generating gas is ejected downward from the gas ejection holes 17a of the insulator 17 of the upper electrode assembly 4 by the gas supply unit 19 after evacuation of the process chamber 2 is performed by the evacuation/opening unit 13. While the plasma-generating gas is being ejected, the high-frequency power supply 12 applies a high-frequency voltage to the electrode 5 of the lower electrode assembly 3. Consequently, a plasma discharge occurs in a space between the upper electrode assembly 4 and the lower electrode assembly 3. Plasma generated by the plasma discharge performs the plasma-etching on the top surface of the semiconductor wafer 7 mounted on the mounting unit 6.

As shown in Fig. 1, the outwardly projecting insulator 8 is mounted to the outer edge of the mounting unit 6 of the lower electrode assembly 3. Similarly, the outwardly projecting insulator 18 is mounted to the outer edge of the insulator 17 of

the upper electrode assembly 4. The insulators 8 and 18 suppress an abnormal discharge between respective edges of the upper electrode assembly 4 and the lower electrode assembly 3 during generating the plasma discharge in the space between the electrode assemblies 4 and 3, and thus allowing the plasma to be generated stably above the mounting unit 6 of the lower electrode assembly 3.

The processes of the plasma etching will be described below. As shown in Fig. 2A, the semiconductor wafer 7 with the protective sheet 7a affixed thereto is mounted on the mounting unit 6 of the lower electrode assembly 3 with being held by vacuum suction. After the process chamber 2 is evacuated, the plasma-generating gas is blown from the gas ejection holes 17a against the top side of wafer 7. While the gas is being blown, the high-frequency power supply 12 applies a high-frequency voltage between the lower and upper electrode assemblies 3 and 4, thus generating the plasma discharge in the space above the wafer 7.

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A5 cancel'd The plasma discharge generated in the mixed gas containing SF_6 generates fluorine radicals 30 as shown in Fig. 2B. The flow of helium gas (indicated by arrows) in the plasma-generating gas causes the fluorine radicals 30 to blow against the surface of the wafer 7. The fluorine radical 30 affects the silicon, which is contained in the wafer 7, for changing the silicon into gaseous silicon tetrafluoride 31, which transpires from the surface of the wafer 7, as shown in Fig. 3A, and is removed from the surface by the flow of the helium gas.

Page 6, line 24 to Page 7, line 3, cancel and replace with:

A6 Thus, the reaction products, which are likely to remain and accumulate on the surface to be processed of the wafer 7 after the reaction for removing the silicon, can be removed without fail. Accordingly, an overall etching rate, which is affected by such reaction products remaining on the surface to be processed, does not decrease, and variation in the etching

A6' cont

effect caused by reaction products remaining and clustering on the surface to be processed does not take place during etching.

Page 7, lines 11-19, cancel and replace with:

A7

It is known that the helium gas requires a lower minimum voltage for initiating a discharge than other gas. The sulfur hexafluoride (SF_6) requires a high minimum voltage for initiating to discharge. Therefore, only sulfur hexafluoride at a pressure not less than several hundreds of Pa generates a discharge only in an area under a strong electric field even if the high frequency voltage is applied between the parallel plate electrodes, and thus, generates variation in etching distribution. For this reason, the helium gas, which easily discharges, is mixed, thereby realizing highly uniform etching even with a low high-frequency voltage or a low high-frequency power.